Water Quality Technical Report

State Route 1 Roadway Embankment Repair

12-0K0100
12-ORA-1
PM 29.0/ 29.5

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State of California
Department of Transportation
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Introduction

1.1 ROUTE DESCRIPTION

State Route 1 (SR-1), commonly known as Pacific Coast Highway (PCH), was added to the State Highway System by the State Highway Board Amendment of 1919. PCH is one of the most unique highways in America, and also one of the longest. PCH starts in the City of San Juan Capistrano, and ends where it merges with Highway 101 at Legget, California.

1.2 PURPOSE AND NEED OF TECHNICAL REPORT

The objective of the *Water Resources and Water Quality Technical Report* is to describe the existing water resources, to determine if the potential impacts of the project on the water resources would be significant based on preliminary project information, and to identify feasible avoidance or minimization measures to address any potential impacts

1.3 PROJECT DESCRIPTION

This project proposes to protect the roadway embankments on State Route 1 (PCH) from 0.4 miles south of Warner to 2.0 miles north of Seapoint Avenue in the City of Huntington Beach. The project will restore the partially washed out highway embankment/ shoulder pavement (Figure 1-1) with the installation of a 475 ft metal sheet piling for embankment/ shore protection, 495 ft pedestrian safety cable, and install either a 538 ft Metal Beam Guard Rail (MBGR) or a 550 ft concrete barrier to meet clear recovery zone standards.

Figure 1-1: Photos of project location where embankment has washed out from tidal conditions (photos taken October 2008, March 2009 and June 2009)

October 2008

October 2008

March 2009

March 2009

June 2009

June 2009

1.3.1 Project Alternatives

Alternative 1

No-Build. This alternative proposes no improvements to restore roadway embankment. This alternative does not address the erosion and degradation of the roadway embankments. By selecting this alternative further erosion of the embankment will jeopardize the integrity of the roadway at this location and might result in partial closure of the northbound lanes of State Route 1. Since this alternative will not enhance the roadway embankment, this alternative will not be considered.

Alternative 2

This alternative will restore the eroded highway embankment, northbound shoulder and protects the highway from future erosion. This alternative will construct 475 ft of steel sheet piles at the highway embankment and install 538 feet (2.4 feet high) of Metal Beam

Guard Rail (MBGR) and 495 feet (3 feet high) of pedestrian safety cable rail along the edge of the sheet pile wall. This alternative will bring the traffic safety to current Department design standards for Clear Recovery Zone requirements. Refer to Appendix A for preliminary cross sections and layout plans for the project.

Alternative 3
This alternative will restore the eroded highway embankment, northbound shoulder and protects the highway from future erosion. This alternative will construct 475 feet of steel sheet piles at the highway embankment and install approximately 550 feet (3 feet high) of concrete barrier (Type 60) and 495 feet (3 feet high) of pedestrian safety cable rail along the edge of the sheet pile wall. A crash cushion is required at the front tip of the barrier. This alternative will bring the traffic safety to current Department design standards for Clear Recovery Zone requirements.

2.0 Affected Environment

2.1 EXISTING WATER RESOURCES

2.1.1 Regional and Local Climate and Precipitation

Orange County's climate is classified as Mediterranean, characterized by cool, dry summers and mild, wet winters. The major contributors to the climate are the Eastern Pacific High and the moderating effects of the Pacific Ocean.

The current rainy season in the project area, as defined by the Santa Ana Regional Water Quality Control Board (RWQCB), is from October 1st through May 1st. However, most rainfall occurs during the winter season, November through March. Rainfall in the project area averages approximately 15 inches (38 centimeters) annually. The peak monthly rainfall in the project vicinity generally occurs between January and February, with an average peak rainfall intensity of approximately 5.5-inches (14 centimeters) in 24 hours.

2.1.2 Surface Water Features

The Westminster Watershed covers approximately 74.1 square miles in the southwestern corner of Orange County. It includes portions of the cities of Anaheim, Cypress, Fountain Valley, Garden Grove, Huntington Beach, Los Alamitos, Santa Ana, Seal Beach, Stanton, and Westminster. Three main tributaries drain this watershed. The Los Alamitos Channel drains into the San Gabriel River. The Bolsa Chica Channel empties into the Anaheim Bay-Huntington Harbour complex. The East Garden Grove-Wintersburg Channel drains through Bolsa Bay into Huntington Harbour. (OCRDMD 2009).

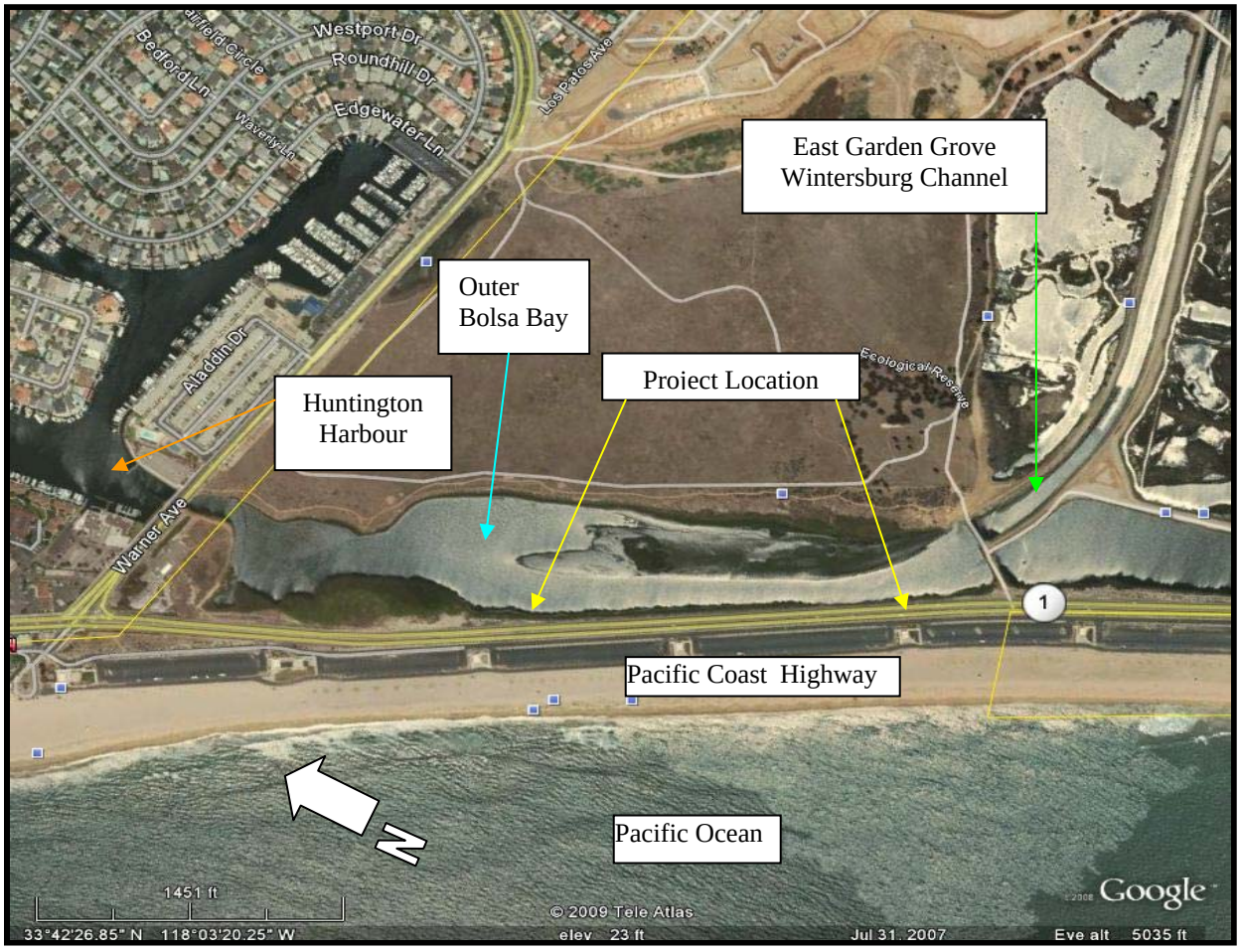
The proposed project is within the location of outer Bolsa Bay (Hydrological Unit 801.11) is composed of residential and commercial development to the north and east of the project location. Outer Bolsa bay is influenced by ocean tidal conditions due to the close proximity of Huntington Harbour, Anaheim Bay and the Pacific Ocean. Runoff

from the upper areas of the Westminster watershed is conveyed via the East Garden Grove-Wintersburg Channel that ultimately discharges to outer Bolsa Bay. A weir with tidal gates has been constructed at the discharge point to outer Bolsa Bay to allow runoff to discharge when larger storm events occur and to prevent tidal flows from entering the East Garden-Grove Wintersburg Channel. Runoff from PCH at the project location discharges via surface drains to outer Bolsa Bay.

The present or potential beneficial uses for Bolsa Bay as identified in the Basin Plan include the following (RWQCB 2008):

- Water Contact Recreation (REC 1)
- Non-Contact Water Recreation (REC 2)
- Commercial and Sport fishing (COMM)
- Wildlife Habitat (WILD)
- Rare, Threatened or Endangered Species (RARE)
- Spawning, Reproduction and Development (SPWN)
- Marine Habitat (MAR)
- Shellfish Harvesting (SHEL)

Figure 2-1



2.2 EXISTING WATER QUALITY

2.2.1 Surface Waters

Outer Bolsa Bay is currently has not been designated by the State Water Resources Control Board as impaired under Section 303(d) of the Clean Water Act (CWA). Although outer Bolsa bay has not been designated as impaired under Section 303 (d) of the CWA, Huntington Harbour and Anaheim Bay which share the same tidal influence with outer Bolsa Bay has been identified in the 2006 CWA 303(d) list of impaired water bodies (US EPA approval 2007). Hunting Harbour has been listed for unknown sources of chlordane, copper and lead while Anaheim Bay is listed for unknown sources of Dieldrin (tissue), nickel, polychlorinated biphenyls (PCBs) and sediment toxicity (SWRCB 2007).

Surface water quality within the outer Bolsa Bay is primarily influenced by non-point and point sources of storm water and non-storm water runoff from urban and residential developments (via the East Garden Grove Wintersburg Channel) and tidal influences from the Pacific Ocean via Anaheim Bay and Huntington Harbour. Contaminants affecting the watershed include various vehicle-related pollutants such as oil, grease, and other petroleum products from roadways. Other pollutants that also affect the watershed include illicit dumping, pesticides, herbicides, and fertilizers from parks, residential homes, and golf courses. Contaminated runoff from irrigation within the watershed also contributes to the poor surface water quality within the watershed.

2.2.2 Groundwater

Groundwater levels at the project location are relatively high due to the close proximity of outer Bolsa Bay and the Pacific Ocean. Soil borings were conducted in July 2009 at two locations to determine the groundwater levels at the project location. The soil borings concluded that both locations encountered groundwater at 4.5 feet below the roadway surface. This concludes that any excavation below 4.5 feet will encounter groundwater and any groundwater that is extracted and discharged must follow the Santa Ana RWQCBs permit for construction site dewatering discharges as discussed in section *2.3.3 Applicable Permits* and *3.2.5 Construction Site Dewatering* of this Report

2.2.3 Erosion and Siltation

Outer Bolsa Bay is influenced by both surface runoff from storm events from the Westminster watershed via the East Garden Grove Wintersburg Channel and rising and falling tides of the Pacific Ocean via Anaheim Bay and Huntington Harbour. The directed flows from the East Garden Grove Wintersburg Channel at the project location and the daily tides have created channel erosion at the roadway embankment on PCH.

2.3 APPLICABLE REGULATIONS, PLANS, AND POLICIES

2.3.1 Federal

U.S. Environmental Protection Agency (USEPA)

The primary federal law governing water quality is the Clean Water Act (CWA) of 1972. This act provides for the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters. The CWA emphasizes technology-based (end-of-pipe) control strategies and requires discharge permits to use public resources for waste discharge. The Act also limits the amount of pollutants that may be discharged and requires wastewater to be treated with the best treatment technology economically achievable regardless of receiving water conditions.

The 1987 amendments to the Clean Water Act included Section 402(p), which establishes a framework for regulating municipal and industrial storm water discharges. The amendment also provides a framework for regulating storm water runoff from construction sites. On November 16, 1990, the USEPA published final regulations that established requirements for storm water permits.

In 1998, Section 303(d) was amended to the CWA, requiring the state to identify and maintain a list of waterbodies that do not meet water quality standards and also implement a Total Maximum Daily Load (TMDL) program for impaired waterbodies.

2.3.2 State

State Water Resources Control Board (SWRCB)

The Porter-Cologne Water Quality Control Act of 1969 (Porter-Cologne Act) is the basic water quality control law for California. The Act authorizes the state to implement the provisions of the Clean Water Act. The Porter-Cologne Act establishes a regulatory program to protect the water quality of the state and the beneficial uses of state waters. Under this act, the State Water Resources Control Board (SWRCB) provides policy guidance and review for the Regional Water Quality Control Boards (RWQCBs), and the RWQCBs implement and enforce the provisions of the Act.

The establishment of the NPDES regulations in 1987, under Section 402(p) of the Clean Water Act, required that the USEPA delegate the responsibility of the National Pollutant Discharge Elimination System (NPDES) program to the State. The SWRCB was given the responsibility to enforce the regulations of the NPDES program and did so in the form of the *NPDES Permit for General Construction Activities* (Order No. 99-08-DWQ), adopted in 1992 and amended in August of 1999 and 2001. On December 2, 2002, the SWRCB approved the "*Modification of Water Quality Order 99-08-DWQ State Water Resources Control Board (SWRCB) NPDES General Permit for Construction Activity (One to Five Acres)*". The Permit requires that all owners of land within the State with

construction activities resulting in more than 0.4 hectares (1 acre) of soil disturbance (clearing, grubbing, grading, trenching, stockpile, utility relocation, temporary haul roads, etc.), apply for the General Permit. The purpose of the Permit is to ensure that the land owners:

1. Eliminate or reduce non-storm water discharges to storm drains and receiving waters of the U.S.;
2. Develop and implement a Storm Water Pollution Prevention Plan (SWPPP);
3. Inspect the Water Pollution Controls (WPC) specified in the SWPPP; and
4. Monitor storm water runoff from construction sites to ensure that the BMPs specified in the SWPPP are effective.

Regional Water Quality Control Board (RWQCB)

The proposed project is located within the jurisdiction of the Santa Ana RWQCB (Region 8). All projects within the Santa Ana Region are subject to the requirements of the Santa Ana RWQCB. The Santa Ana RWQCB has prepared the *1995 Water Quality Control Plan for the Santa Ana Basin (8)* to help preserve and enhance water quality and to protect the beneficial uses of state waters. The Basin Plan for the Santa Ana Region is more than just a collection of water quality goals and policies, descriptions of conditions, and discussions of solutions. It is also the basis for the Regional Board's regulatory programs. The Basin Plan establishes water quality standards for all the ground and surface waters of the region. The term "water quality standards," as used in the federal Clean Water Act, includes both the beneficial uses of specific water bodies and the levels of quality which must be met and maintained to protect those uses. The Basin Plan includes an implementation plan describing the actions by the Regional Board and others that are necessary to achieve and maintain the water quality standards. Water quality problems in the region are listed in the Basin Plan, along with the causes, where they are known. For water bodies with quality below the levels necessary to allow all the beneficial uses of the water to be met, plans for improving water quality are included. (SARWQCB, 1995).

California Coastal Commission

This project is within the coastal zone. The Coastal Zone Management Act of 1972 (CZMA) is the primary federal law enacted to preserve and protect coastal resources. The CZMA sets up a program under which coastal states are encouraged to develop coastal management programs. States with an approved coastal management plan are able to review federal permits and activities to determine if they are consistent with the state's management plan.

California has developed a coastal zone management plan and has enacted its own law, the California Coastal Act of 1976, to protect the coastline. The policies established by the California Coastal Act are similar to those for the CZMA; they include the protection and expansion of public access and recreation, the protection, enhancement and restoration of environmentally sensitive areas, protection of agricultural lands, the

protection of scenic beauty, and the protection of property and life from coastal hazards. The California Coastal Commission is responsible for implementation and oversight under the California Coastal Act.

2.3.3 Applicable Permits

Currently the Department has a statewide NPDES permit that covers all Department properties, facilities and activities. All projects within the Department's jurisdiction must conform to the requirements of the Statewide National Pollutant Discharge Elimination System (NPDES) Permit for Storm Water Discharges From the State of California, Department of Transportation (Caltrans) Properties, Facilities and Activities (Order No. 99-06-DWQ, NPDES No. CAS000003) adopted by the SWRCB on July 15, 1999. This permit allows the Department to operate, maintain, and construct on State right of way without applying for individual General Permits for each construction project. The Permit requires the Department to adhere to the provisions of the Statewide General NPDES Permit for Construction Activities, Order No. 99-08-DWQ, NPDES No. CAS000002. The Permit also requires that a Storm Water Pollution Prevention Plan (SWPPP) be prepared and implemented for all projects greater than 1 acre (0.4 hectares) of soil disturbance in conformance with the General NPDES Permit for Construction Activities. A Notification of Construction (NOC) be filed with the RWQCB at least 30 days prior to any soil-disturbing activities. In addition, all projects are subject to the Best Management Practices (BMPs) specified in the Caltrans Storm Water Management Plan (SWMP).

In addition to the Department's NPDES Storm Water Permit, the project would require a 401 Water Quality Certification from the Santa Ana RWQCB, a 404 Permit from the Army Corps of Engineers and a Coastal Development Permit from the California Coastal Commission. The Department has obtained blanket coverage under the General Waste Discharge Requirements for Discharges to Surface Waters That Pose an Insignificant (DE MINIMUS) Threat to Water Quality (Order No. R8-2009-003, NPDES No. CAG998001). Additional information regarding dewatering is included in this report in *Section 3.2.5, Construction Site Dewatering.*

3.0 Environmental Evaluation

3.1 SIGNIFICANCE THRESHOLDS AND CRITERIA

The proposed project would be considered to have a significant impact on water resources if it substantially affected the overall amount of runoff, the amount of discharge into natural surface drainages, or the existing pattern of natural surface drainage in the project vicinity. The proposed project would be considered to have a significant impact on water quality if it substantially contributed to the exceedance of any adopted water quality standard or conflicted with the objectives, plans, goals, policies, or implementation of the Santa Ana RWQCB's *Basin Water Quality Control Plan (1995).*

3.2 POTENTIAL PROJECT IMPACTS

3.2.1 Alternative 1 (No Build)

The No Build Alternative would not result in the construction of a roadway embankment repair. Current tidal and storm flows will continue to erode the roadway embankment which will result in the closure of travel lanes due to safety issues. In addition the eroded embankment (gravel and soil) will fall in the Outer Bolsa Bay causing sediment discharges to the receiving water body.

3.2.2 Alternative 2 ("Build" Alternative/ MBGR)

Runoff and Drainage

The proposed project would not have the potential to significantly alter the existing drainage patterns, erosion and absorption rates, and runoff volume within the project limits. There will be no percent increase in impervious surface from the proposed project location. Based on preliminary design, the project proposes to install 475 ft of metal sheet piling for embankment/ shore protection, 538 ft of Metal Beam Guard Rail (MBGR) and 495 ft of pedestrian cable to meet clear recovery zone standards.

The current runoff and drainage for the northbound lanes of PCH drain to existing overside drains that discharge to Outer Bolsa Bay. The project proposes to stabilize the roadway embankment to prevent further damage to the roadway. There is no increase of impervious surface as well as any improvements to the drainage system at the project location.

Water Quality Degradation

The proposed project is expected to have a less than significant impact on surface water quality if temporary and/or permanent avoidance/minimization measures are incorporated into the project plans. There is no increase in impervious surface as part of the project

thus the roadway runoff will not change but the proposed build alternatives include the repair of the damaged roadway embankment. The repair of installing a metal sheet pile wall will eliminate a source of sediment discharge that was a result of the tidal and storm flows eroding the existing roadway embankment slope.

Temporary impacts as a result of soil disturbing activities will be addressed by the Storm Water Pollution Prevention Plan (SWPPP) prepared for the project and the BMPs identified to address these temporary impacts. Construction impacts such as the installation of the metal sheet pile wall adjacent to the Outer Bolsa Bay using a vibration pile driver can cause the re-suspension of sediment located within the bay. Measures such as the installation of a turbidity control curtain to contain any re-suspended sediment from the proposed construction of the sheet pile wall. In addition, the turbidity curtain can also prevent the transport of re-suspended sediment from the construction disturbed soil areas that are inundated as a result of low/high tide influences. The construction of the Metal Beam Guard Rail (MBGR) and the pedestrian safety cable require drilling into the ground to place the support beams/ poles. The depth of the drilling may vary based on the design plans and specifications. The depth of the groundwater is 4.5 feet below the roadway surface and the drilling my encounter the groundwater during construction. This elevation of groundwater may vary due to the close proximity to the Pacific Ocean and Outer Bolsa Bay which have tidal influences to consider. Any construction site dewatering discharges are subject to the Santa Ana RWQCB requirements as discussed in section *2.3.3 Applicable Permits* and *3.2.5 Construction Site Dewatering* of this Report

Erosion and Sedimentation

The proposed project is located in an area that is relatively flat and the project does not involve grading/ regarding slopes. The potential erosion and sediment impacts associated with the project include the re-suspension of sediment during the installation of the metal sheet pile wall and the drilling/ excavation of the MBGR foundations. Sediment control measures will be identified in the project's SWPPP to address any erosion and sedimentation issues the project may have during construction. Post construction erosion and sedimentation issues will be resolved with the installation of the metal sheet pile wall. Currently, Outer Bolsa Bay tidal and storm influences are causing erosion of the existing roadway embankment.

3.2.3 Alternative 3 (Concrete Barrier)

As described in Section 1.3.1, Alternative 3 has the same improvements as in Alternative 2 with the exception that a 550 ft concrete barrier will be constructed in place of the 538 ft MBGR that is proposed in Alternative 2. This alternative creates additional temporary impacts due to the preparation and construction of the concrete barrier. The construction of a concrete barrier may require excavation for a foundation that can lead to additional sediment control issues as well as complying with dewatering requirements as discussed in section 3.2.2 in this report. Other temporary impacts that will be addressed in the SWPPP is the control of concrete waste during the construction of the concrete barriers.

Proper concrete washouts will be included as one of the BMPs in the project's SWPPP for waste management control.

3.2.4 Construction Site Dewatering (Alternatives 2 and 3)

Dewatering discharge for Alternatives 2 and 3 could adversely impact surface water quality if the effluent is rich in sediment or contaminated with chemicals. Extracted groundwater may contain pollutants which may be a result of the decomposition of organic materials (e.g., hydrogen sulfide), leaking underground storage tanks and fuel lines, surface spills, sewage, past use of liquid waste impoundments, or the potential presence of nutrients (phosphorous and nitrogen compounds). Due to the close proximity to the Pacific Ocean there is the possibility that groundwater at the project location may contain salt water. It is uncertain if temporary dewatering may occur during the installation of the sheet pile, specifically if temporary coffer dams are needed for construction. If the project requires construction site dewatering, the discharges must be subject to the Waste Discharge Requirements (WDR) for Discharges to Surface Waters that Pose an Insignificant (DE MINIMUS) Threat to Water Quality (Order No. R8-2009-0003, NPDES No. CAG998001). The Department has obtained blanket coverage under this DE MINIMUS permit and must conform to the requirements of the Monitoring and Reporting Program (Order No. R8-2009-0003-50, NPDES No. CAG998001). Dewatering BMPs would be used to control sediments and pollutants. An EPA certified laboratory would test and monitor the discharge for compliance with the requirements of the RWQCB. This is also discussed in *Section 2.3.3, Applicable Permits*.

All effluents from dewatering operations must be tested in an Environmental Protection Agency (EPA) certified laboratory for trace pollutants and approved by the RWQCB before being discharged into receiving waters. In most dewatering operations, sediment is the primary pollutant of concern. However, the discharges must also be tested for oil and grease, total suspended solids (TSS), total nitrogen (TN), total petroleum hydrocarbons, and sulfides. If the discharge effluent is not visibly clear, then sediment control BMPs such as the Baker Tanks, must be employed to treat the effluent prior to discharge. The specific discharge requirements, limits, and amounts are determined by the permit and may vary for individual projects.

4.0 Recommendations/ Requirements

4.1 Avoidance and Minimization Measures

WQ-1
The project will comply with the provisions of the *Department Statewide NPDES Permit* (Order No. 99-06-DWQ, NPDES No. CAS00003) and the *NPDES General Permit, Water Discharge Requirements (WDRs) for Discharges of Storm Water Runoff Associated with Construction Activities* (Order No. 2009-0009-DWQ, NPDES No. CAS000002) and any subsequent permit in effect at the time of construction

WQ-2
A Storm Water Pollution Prevention Plan (SWPPP) shall be prepared and implemented to address all construction-related activities, equipment, and materials that have the potential impact water quality. The SWPPP shall identify the sources of pollutants that may affect the quality of storm water and include BMPs to control the pollutants, such as sediment control, catch basin inlet protection, construction materials management and non-storm water BMPs. All construction site BMPs shall follow the latest edition of the *Storm Water Quality Handbooks, Project Planning and Design Guide* (Caltrans, 2007)
All work must conform to the Construction Site BMPs requirements specified in the latest edition of the *Storm Water Quality Handbooks, Project Planning and Design Guide* (Caltrans, 2007) to control and minimize the impacts of construction and construction related activities, material and pollutants on the watershed. These include, but are not limited to temporary sediment control, temporary soil stabilization, scheduling, waste management, materials handling, and other non-storm water BMPs.

WQ-3
Design Pollution Prevention Best Management Practices (BMPs) shall be implemented such as preservation of existing vegetation, slope/ surface protection systems (permanent soil stabilization), concentrated flow conveyance systems such as ditches, berms, dikes and swales, overside drains, flared end sections, and outlet protection/ velocity dissipation devices.

WQ-4
Construction site dewatering must conform to the General Waste Discharge Requirements for Discharges to Surface Waters That Pose an Insignificant (DE MINIMUS) Threat to Water Quality (Order No. R8-2009-0003, National Pollutant Discharge Elimination System No. CAG998001), and any subsequent updates to this permit at the time of construction. Dewatering BMPs must be used to control sediments and pollutants and the discharges must comply with the Waste Discharge Requirements (WDRs) issued by the Santa Ana RWQCB

References

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Orange County Resources and Development Management Department Division (OCRDMD). 2009. *Introduction to Westminster Watershed*. Available: <http://www.ocwatersheds.com/watersheds/westminster.asp>. Accessed: July 2, 2009.

State Water Resources Control Board (SWRCB). 2007.2006 *Clean Water Act Section 303(d) List of Impaired Water Quality Limited Segments, Santa Ana RWQCB.* USEPA Approval Date: June28, 2007. Available: <http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/303dlists2006/epa/r8_06_303d_reqtmdls.pdf>

Appendix A

Layout Plans and Cross Sections

INDEX OF PLANS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON

STATE HIGHWAY

IN ORANGE COUNTY
IN HUNTINGTON BEACH
FROM 0.6 MILES SOUTH OF WARNER AVENUE
TO 2.1 MILES NORTH OF SEAPOINT AVENUE

TO BE SUPPLEMENTED BY STANDARD PLANS DATED MAY 2006

Dist	COUNTY	LOCATION CODE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
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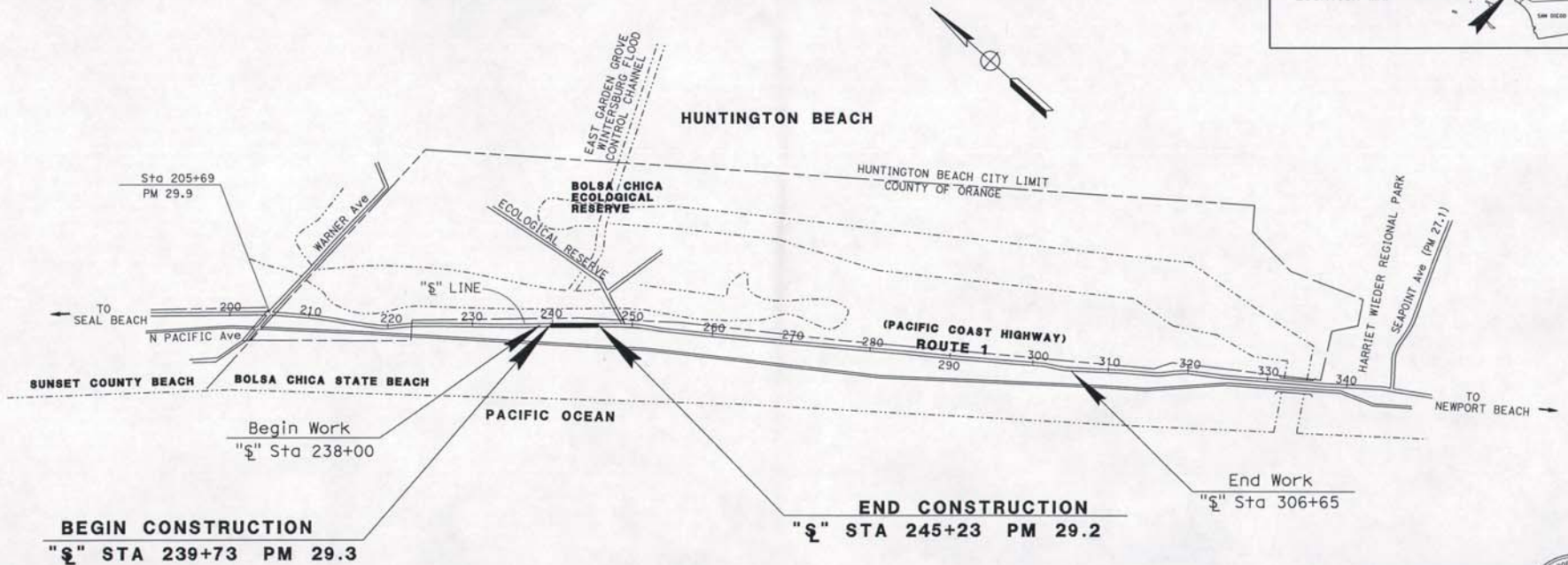

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REGISTERED CIVIL ENGINEER

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

DESIGN ENGINEER NUSHZAD NIKPOUR
PROJECT MANAGER

THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE TO CONTRACTORS."

NO SCALE

CONTRACT No.

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REGISTERED CIVIL ENGINEER DATE

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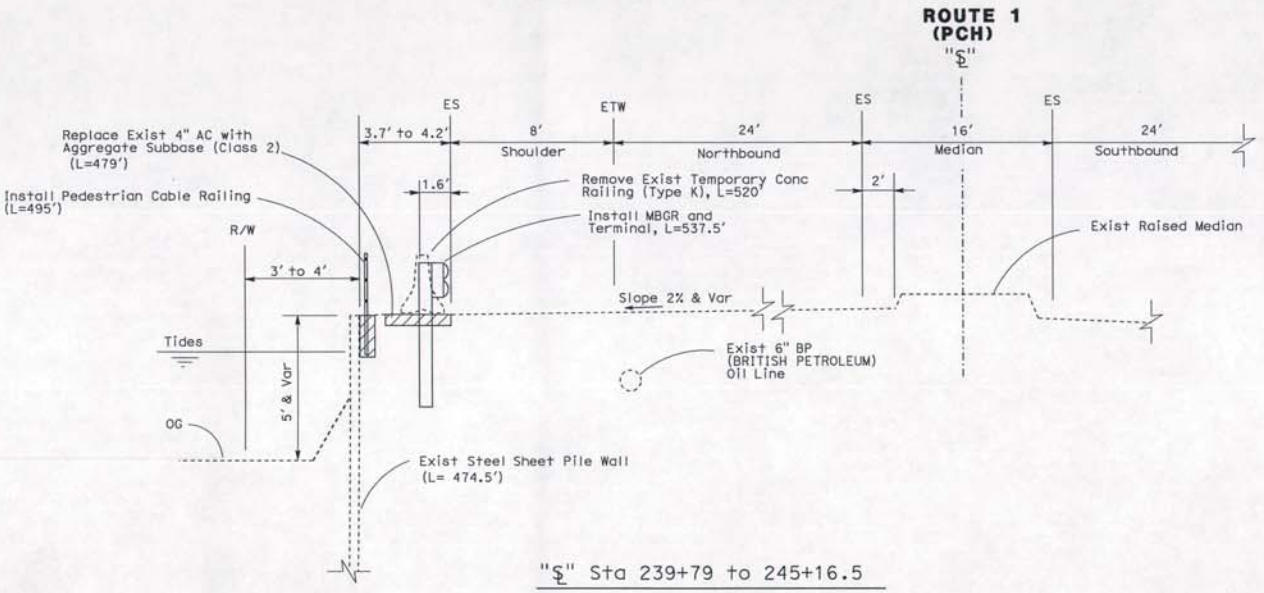
REVISED BY | DATE REVISED

CALCULATED-DESIGNED BY | CHECKED BY

FUNCTIONAL SUPERVISOR

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans



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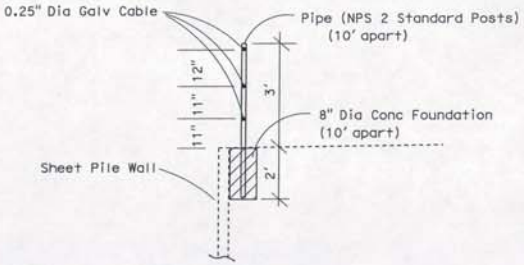

Cable Railing (Typical)

(For more Details See Sheet B11-47 of Standard Plans)

TYPICAL CROSS SECTIONS

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X-1

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REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

Notes:

1. For complete Right of Way and Accurate Access Data, See R/W Record Maps at District Office.
2. Excavated soil from installing MBGR posts and cable railing foundation shall be used in this area.

CURVE DATA

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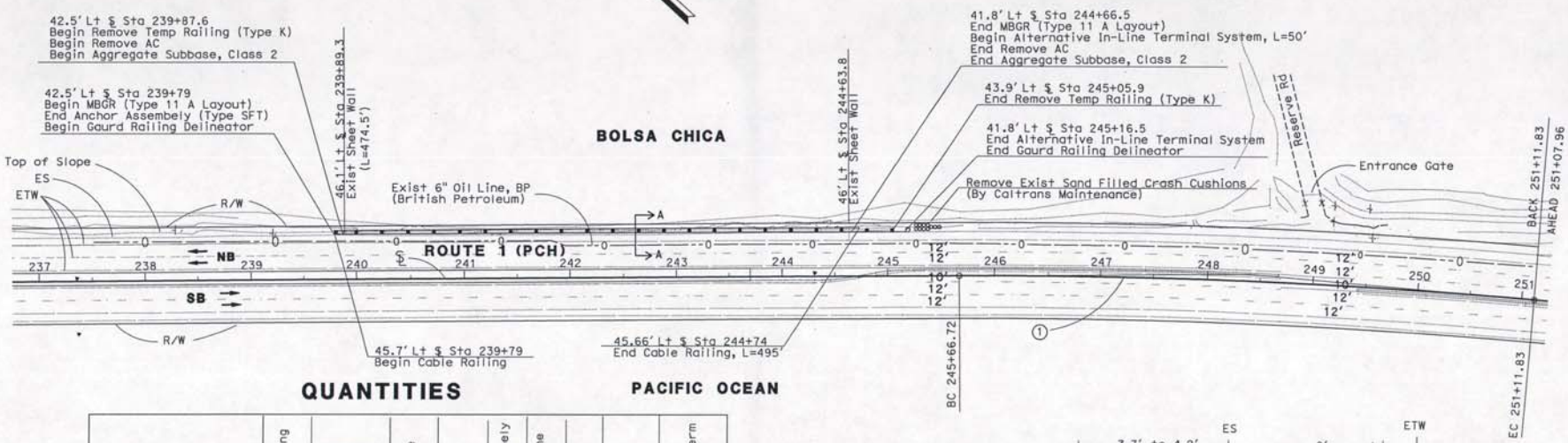
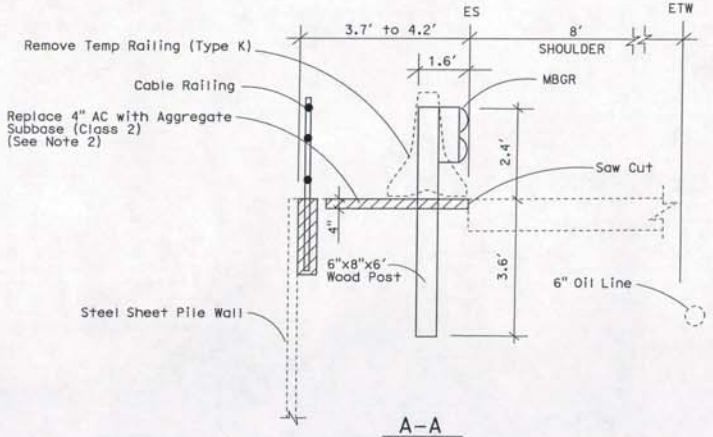


QUANTITIES

Station/Location "℄" Line	Remove Temp Railing (Type K)	Roadway Excavation: Remove AC	Aggregate Subbase (Class 2)	MBGR (Wood Post)	End Anchor Assembely (Type SFT)	Alternative In-Line Terminal System	Cable Railing	Gaurd Railing Delineator	Temp Gravel Bag Berm
	LF	CY	CY	LF	EA	EA	LF	EA	LF
239+87.6 to 245+05.9	520								
239+87.6 to 244+66.5		24	21						
239+79 to 244+66.5				487.5				80	
239+79					1				
244+66.5 to 245+16.5						1		6	
239+79 to 244+74							495		
239+73 to 245+23 (Sheet WPC-1)									550
Total	520	24	21	487.5	1	1	495	86	550



A-A
No Scale

LAYOUT

SCALE : 1"=50'

L-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

FUNCTIONAL SUPERVISOR | CALCULATED-DESIGNED BY | CHECKED BY | REVISED BY | DATE REVISED

LAST REVISION 00-00-00 | DATE PLOTTED => 21-OCT-2009 | TIME PLOTTED => 10:13

BORDER LAST REVISED 4/11/2008 | RELATIVE BORDER SCALE IS IN INCHES (0 1 2 3) | USERNAME => s112242 | DGN FILE => minor b L 1.dgn | CU 12223 | EA 0K0101

Dist	COUNTY	LOCATION CODE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
12	Ora	1	29.3/29.2		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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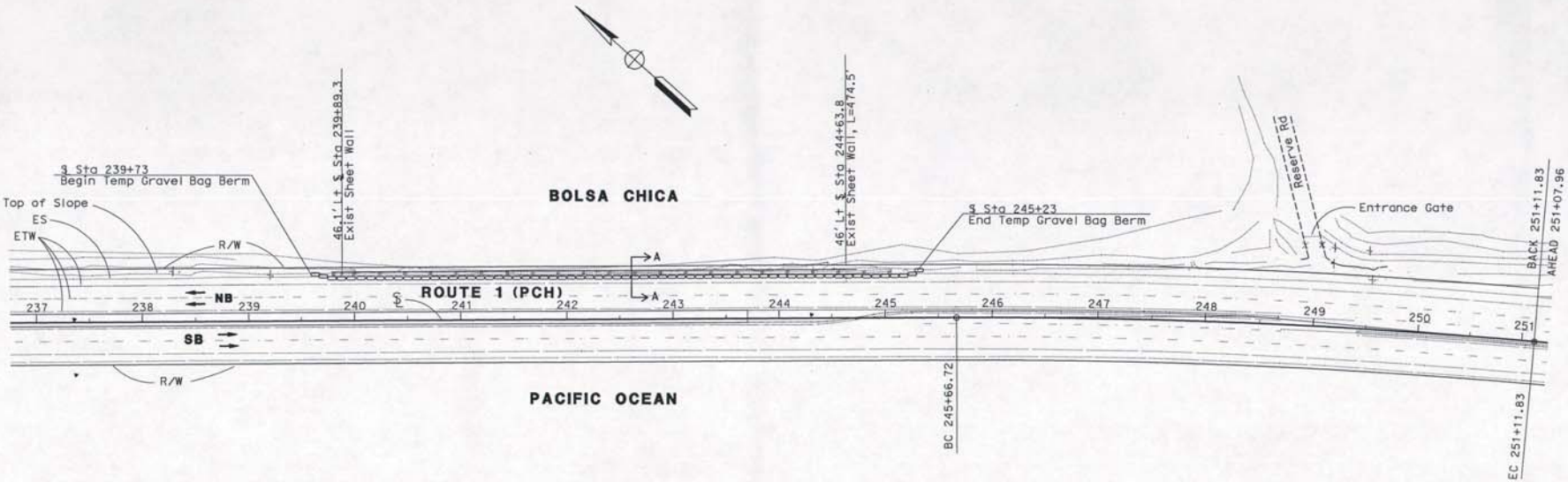
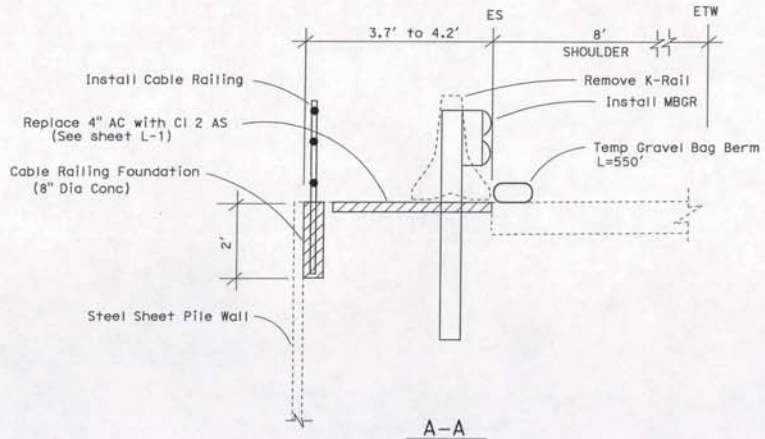
REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

LEGEND

Temp Gravel Bag Berm





A–A
No Scale

TEMPORARY WATER POLLUTION CONTROL PLAN

SCALE : 1"=50'

WPC-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

FUNCTIONAL SUPERVISOR

CALCULATED-DESIGNED BY

CHECKED BY

REVISED BY

DATE REVISED

LAST REVISION DATE PLOTTED => 19-OCT-2009
00-00-00 TIME PLOTTED => 10:38

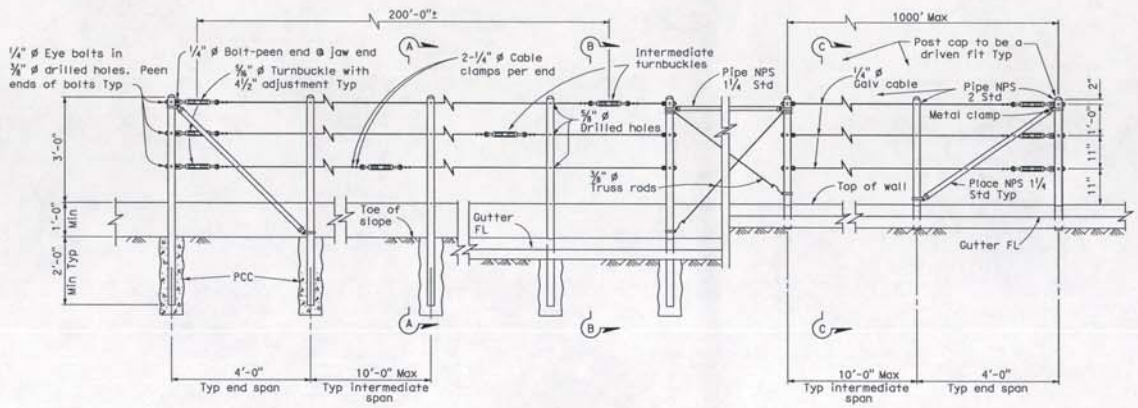
BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

USERNAME => s112242
DGN FILE => storm.dgn

CU 12223

EA 0K0101

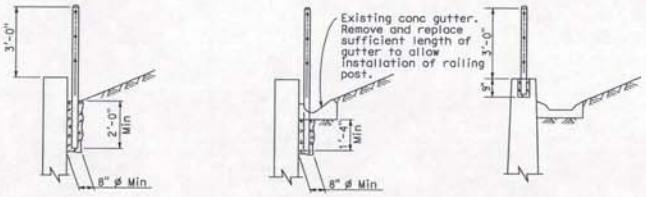


EXISTING WALL (WITHOUT GUTTER)
Existing

RETAINING WALL (WITH GUTTER)
Existing

RETAINING WALL (WITH GUTTER)
New construction

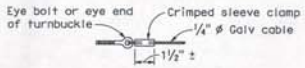
ELEVATION



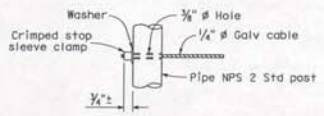
SECTION A-A
Existing

SECTION B-B
Existing

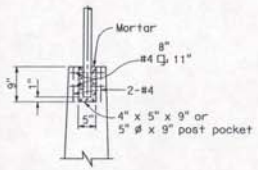
SECTION C-C
New construction



ALTERNATIVE CABLE CONNECTION



ALTERNATIVE DEAD END ANCHORAGE



POST POCKET

NOTES:

1. Maximum distance between turnbuckles shall be 200'-0"±.
2. Intermediate turnbuckles to be placed in adjacent spans.
3. Cable shall not be spliced between intermediate turnbuckles and end posts.
4. All posts, cable, and hardware to be galvanized.
5. Posts to be vertical.
6. Alignment of holes in posts may vary to conform to slope of top of retaining wall.
7. The Contractor shall verify all dependent dimensions in the field before ordering or fabricating any material.
8. Alternative details may be submitted by the Contractor for approval by the Engineer.
9. Line posts shall be braced horizontally and trussed diagonally in both directions at intervals not to exceed 1000'.
10. Post pockets to be centered in top of wall.
11. Typical end spans, braced in both directions, shall be constructed at changes in line where the angle of deflection is 15° or more.
12. Provide thimbles at all cable loops.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

REGISTERED CIVIL ENGINEER

May 1, 2006
PLANS APPROVAL DATE

Tilden Setter
No. C42692
Exp. 03-31-08
CIVIL
REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA

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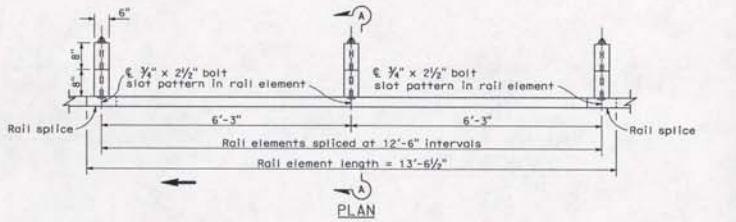
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

CABLE RAILING

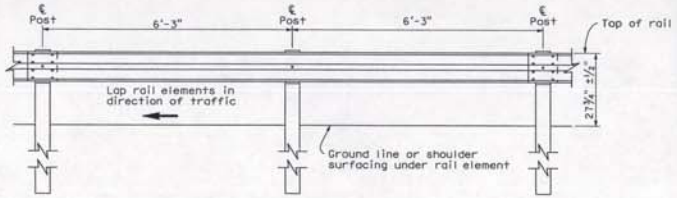
NO SCALE

B11-47

8-8-05

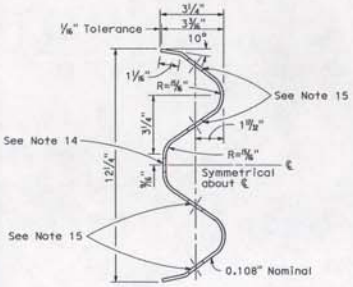


PLAN

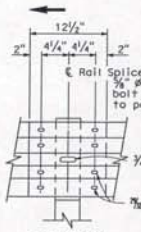


ELEVATION

METAL BEAM GUARD RAILING WITH WOOD POST AND BLOCKS



SECTION THRU RAIL ELEMENT



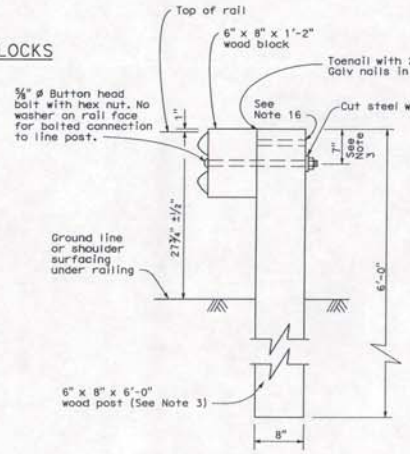
ELEVATION

RAIL ELEMENT SPLICE DETAIL

a) Connect the over lapped end of the rail elements with ⅞" ø x 1⅜" button head oval shoulder splice bolts inserted into the ⅞" x 1⅛" slots and bolted together with ⅝" ø recessed hex nuts. Recess of hex nut points toward rail element. A total of 8 bolts and nuts are to be used at each rail splice connection.

b) The ends of the rail elements are to be overlapped in the direction of traffic (see details).

c) Where end cap is to be attached to the end of a rail element, a total of 4 of the above described splice bolts and nuts are to be used.



SECTION A-A

TYPICAL WOOD LINE POST INSTALLATION

See Note 4

NOTES:

1. For details of steel post installations, see Standard Plan A77A2.
2. For details of standard hardware used to construct guard railing, see Standard Plan A77B1.
3. For details of wood posts and wood blocks used to construct guard railing, see Standard Plan A77C1.
4. For additional installation details, see Standard Plan A77C3.
5. Guard railing post spacing to be 6'-3" center to center, except as otherwise noted.
6. For guard railing typical layouts, see the A77E, A77F and A77G Series of Standard Plans.
7. For terminal system end treatment details, see the A77L Series of Standard Plans.
8. For guard railing end anchor details, see Standard Plans A77H1 and A77I2.
9. For details of guard railing transition to bridge railing, see Standard Plan A77J4.
10. For additional details of guard railing connection to bridge railings, see Standard Plans A77J1, A77J2 and A77K1.
11. For guard railing connection details to abutments and walls, see Standard Plan A77J3.
12. Direction of adjacent traffic indicated by →.
13. For typical guard railing delineation and dike positioning details, see Standard Plan A77C4.
14. Slotted hole for bolted connection of rail element to block and post. See "Section Thru Rail Element".
15. Slotted holes for splice bolts to overlap ends of rail element. See "Section Thru Rail Element".
16. Additional hole in uppermost portion of line post is for potential future adjustments of railing height. See Standard Plan A77C1.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Randell D. Hiatt
REGISTERED CIVIL ENGINEER

May 1, 2006
PLANS APPROVAL DATE

Randell D. Hiatt
No. C50200
Exp. 6-30-07
CIVIL
STATE OF CALIFORNIA

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STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

METAL BEAM GUARD RAILING STANDARD RAILING SECTION (WOOD POST WITH WOOD BLOCK)

NO SCALE

A77A1

11-8-05

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Randell D. Hiatt
REGISTERED CIVIL ENGINEER

May 1, 2006
PLANS APPROVAL DATE

Randell D. Hiatt
No. C50200
Exp. 6-30-07
CIVIL
STATE OF CALIFORNIA

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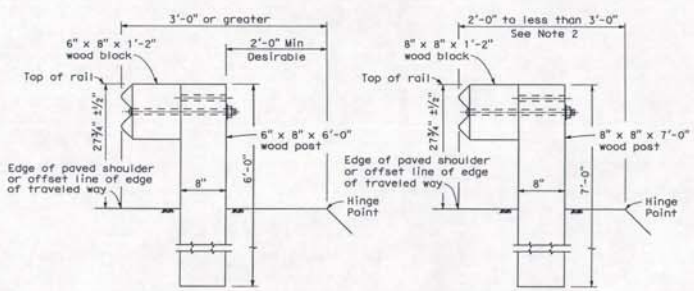
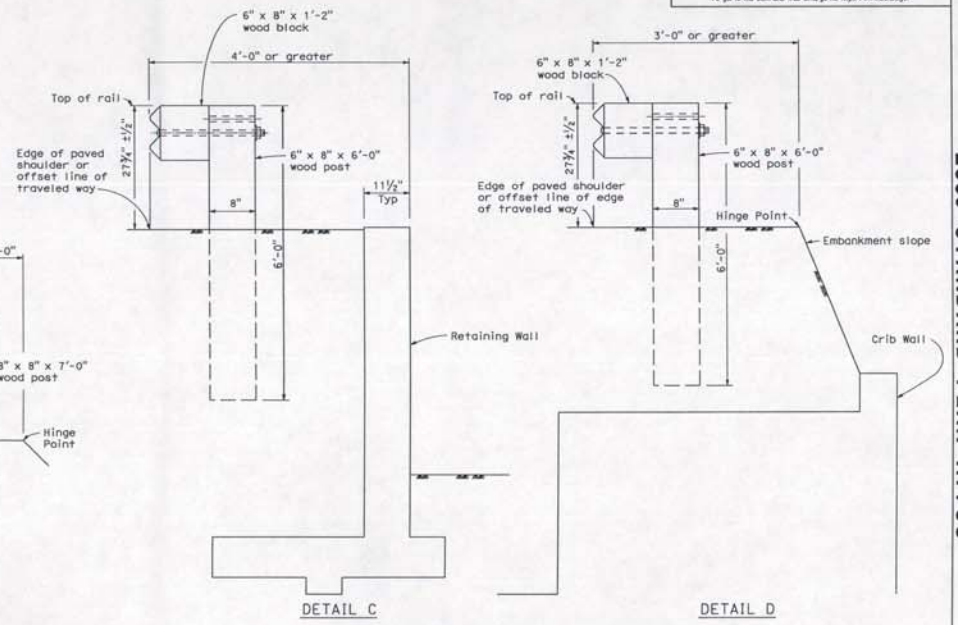


DETAIL A
TYPICAL ROADWAY INSTALLATION
See Note 1

DETAIL B
NARROW ROADWAY INSTALLATION
See Note 1

POST EMBEDMENT



DETAIL C

DETAIL D

INSTALLATION AT EARTH RETAINING WALLS

NOTES:

1. These installation details also applicable to steel line post installations. For Detail A, C, and D, where steel line post installations are constructed, W6 x 9 steel post, 6'-0" in length, with 6" x 8" x 1'-2" notched wood blocks or notched recycled plastic blocks are to be used in place of the size of wood post and wood block shown. For Detail B, where steel line post installations are constructed, W6 x 9 steel post, 7'-0" in length, with 6" x 8" x 1'-2" notched wood blocks or notched recycled plastic blocks are to be used in place of the size of wood post and wood block shown. For additional installation details, see Standard Plans A77A1 and A77A2.
2. Where the distance between the face of the rail and the hinge point is less than 2'-0", see the Project Plans for special details.
3. For dike positioning with guard railing installations, see Standard Plan A77C4.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

METAL BEAM GUARD RAILING TYPICAL LINE POST EMBEDMENT AND HINGE POINT OFFSET DETAILS

NO SCALE

A77C3

11-3-05

2006 STANDARD PLAN A77C3

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Randell D. Hiatt
REGISTERED CIVIL ENGINEER

June 6, 2008
PLANS APPROVAL DATE

Randell D. Hiatt
No. C50200
Exp. 6-30-09
CIVIL
STATE OF CALIFORNIA

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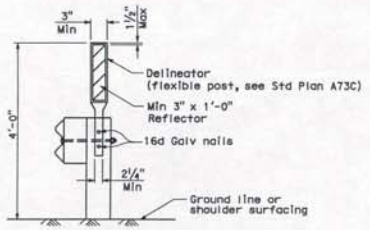
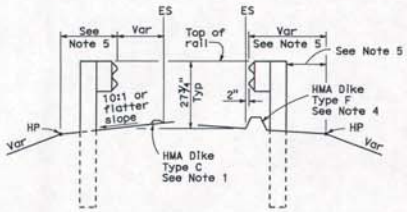
To accompany plans dated _____

NOTES:

1. When necessary to place dike in front of face of guard railing, only Type C dike may be used. For dike details, see Standard Plan A87B.
2. For standard railing post embedment, see Standard Plans A77C3.
3. Guard railing delineation to be used where shown on the Project Plans.
4. When dike or curb is placed under guard railing, the maximum height of the dike or curb shall be 4". Mountable dike should not be used. For dike and curb details, see Revised Standard Plans RSP A87A and Standard Plan A87B.
5. For details of typical distance between the face of rail and hinge point, see Standard Plan A77C3.



GUARD RAILING DELINEATION
See Note 3



DIKE POSITIONING
See Note 1

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

METAL BEAM GUARD RAILING TYPICAL RAILING DELINEATION AND DIKE POSITIONING DETAILS

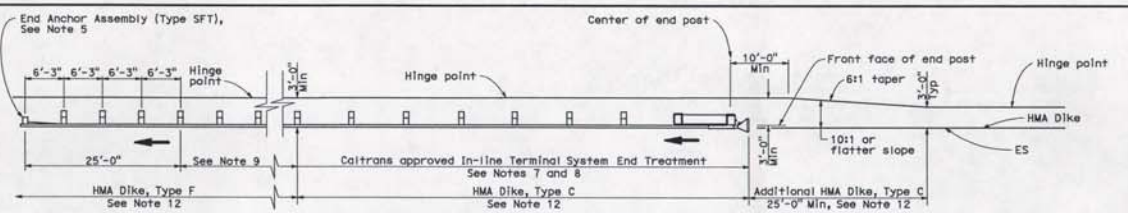
NO SCALE

RSP A77C4 DATED JUNE 6, 2008 SUPERSEDES STANDARD PLAN A77C4 DATED MAY 1, 2006 - PAGE 47 OF THE STANDARD PLANS BOOK DATED MAY 2006.

REVISED STANDARD PLAN RSP A77C4

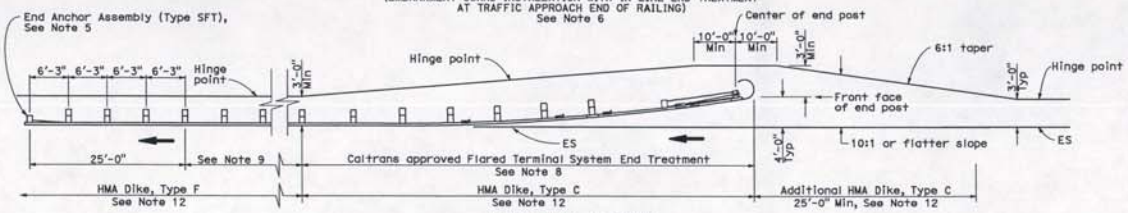
12-19-07

2006 REVISED STANDARD PLAN RSP A77C4



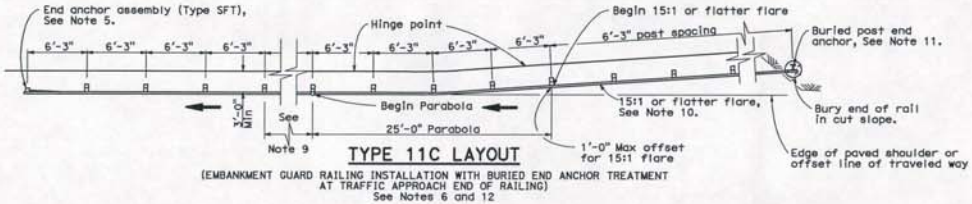
TYPE 11A LAYOUT

(EMBANKMENT GUARD INSTALLATION WITH IN-LINE END TREATMENT AT TRAFFIC APPROACH END OF RAILING)
See Note 6



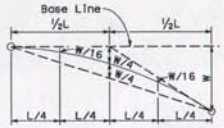
TYPE 11B LAYOUT

(EMBANKMENT GUARD RAILING INSTALLATION WITH FLARED END TREATMENT AT TRAFFIC APPROACH END OF RAILING)
See Note 6

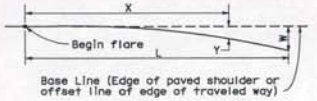


TYPE 11C LAYOUT

(EMBANKMENT GUARD RAILING INSTALLATION WITH BURIED END ANCHOR TREATMENT AT TRAFFIC APPROACH END OF RAILING)
See Notes 6 and 12



TYPICAL PARABOLIC LAYOUT

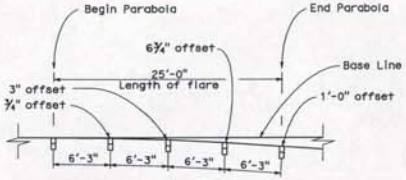


Base Line (Edge of paved shoulder or offset line of edge of traveled way)

$Y = \frac{WX^2}{L^2}$

Y = Offset from base line
W = Maximum offset
X = Distance along base line
L = Length of flare

PARABOLIC FLARE OFFSETS



TYPICAL FLARE OFFSETS FOR 1 FOOT MAX END OFFSET

NOTES:

1. Line post, blocks and hardware to be used are shown on Standard Plans A77A1, A77A2, A77B1, A77C1, and A77C2.
2. Guard rail post spacing to be 6'-3" center to center, except as otherwise noted.
3. Except as noted, line posts are 6" x 8" x 6'-0" wood with 6" x 8" x 1'-2" wood blocks. W6 x 9 steel posts, 6'-0" in length, with 6" x 8" x 1'-2" notched wood blocks or recycled plastic blocks may be used for 6" x 8" x 6'-0" wood post with 6" x 8" x 1'-2" wood blocks where applicable and when specified.
4. Direction of adjacent traffic indicated by ➡.
5. For End Anchor Assembly (Type SFT) details, see Standard Plan A77H1.
6. Layout Types 11A, 11B or 11C are typically used where guard railing is recommended to shield embankment slopes and a crashworthy end treatment is required for only one direction of traffic.
7. In-line Terminal System End Treatments are used where site conditions will not accommodate a flared end treatment.
8. The type of terminal system end treatment to be used will be shown on the Project Plans.
9. Dependent on site conditions (embankment height and side slope), construction of additional guard railing (length equal to multiples of 12'-6" with 6'-3" post spacing) may be advisable.
10. The 15:1 or flatter flare used with buried end anchors is based on the edge of the paved shoulder or offset line of edge of the traveled way. The length of guard railing within the 15:1 or flatter flare is based on site conditions and should be a length equal to multiples of 12'-6".
11. For details of the buried post end anchor used with Type 11C Layout, see Standard Plan A77I2.
12. Where placement of dike is required with guard railing installations, see Revised Standard Plan RSP A77C4 for dike positioning details.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Randell D. Hiatt
REGISTERED CIVIL ENGINEER

June 6, 2008
PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER
Randell D. Hiatt
No. C50200
Exp. 6-30-09
CIVIL
STATE OF CALIFORNIA

To accompany plans dated _____

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

METAL BEAM GUARD RAILING TYPICAL LAYOUTS FOR EMBANKMENTS

NO SCALE

RSP A77E1 DATED JUNE 6, 2008 SUPERSEDES STANDARD PLAN A77E1 DATED MAY 1, 2006 - PAGE 48 OF THE STANDARD PLANS BOOK DATED MAY 2006.

REVISED STANDARD PLAN RSP A77E1

12-19-07

2006 REVISED STANDARD PLAN RSP A77E1

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Randall D. Hiatt
REGISTERED CIVIL ENGINEER

May 1, 2006
PLANS APPROVAL DATE

Randall D. Hiatt
No. C50200
Exp. 6-30-07
CIVIL
REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA

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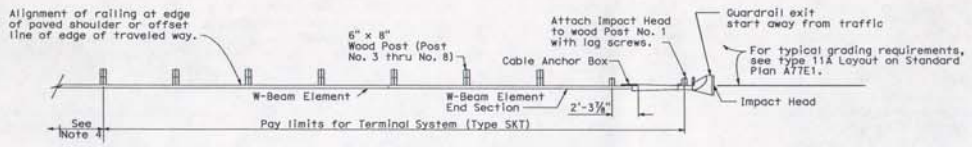
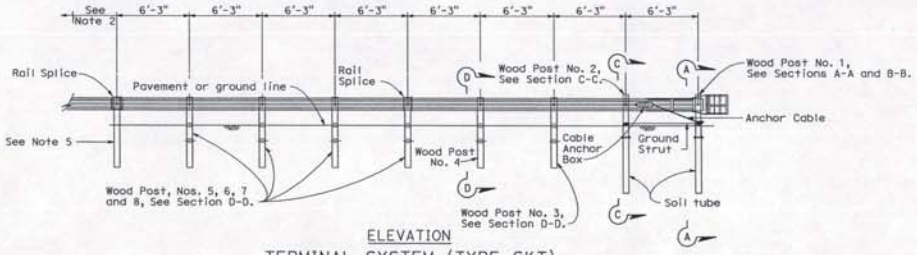


PLAN

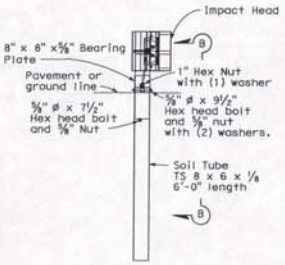


ELEVATION

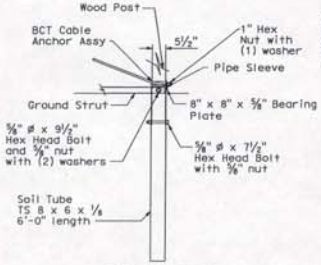
TERMINAL SYSTEM (TYPE SKT)

NOTES:

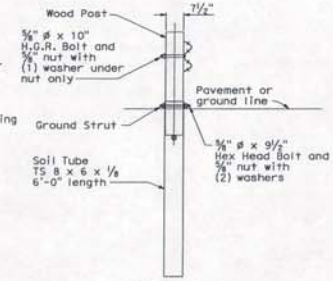
1. For additional details of Terminal System (Type SKT), refer to the manufacturer's installation instructions.
2. Terminal System (Type SKT) must be constructed so that the full length of the terminal system guard railing is in straight alignment. Terminal System (Type SKT) can be flared at a maximum rate of 25:1 to prevent the impact head from encroaching on the shoulder. The flare is not required and may be decreased or eliminated for specific installations.
3. Terminal System (Type SKT) not to be used where extrusion of the rail on the back side of the installation would be in the path of pedestrian traffic or where there is less than 25'-0" between the outlet side of the Impacted Head and any adjacent vehicle traffic.
4. For the length and type of metal beam guard railing or metal barrier railing the terminal system is attached to, see Project Plans. For typical use of this terminal system with guard railing, see the A77E, A77F and A77G Series of the Standard Plans.
5. Attach rail element to this post and block. Payment for this post, block and hardware is included in payment for the type of railing or barrier the terminal system is attached to, not part of payment for Terminal System (Type SKT).



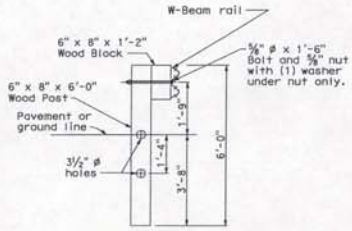
SECTION A-A
Post No. 1



SECTION B-B
Partial view Post No. 1



SECTION C-C
at Post No. 2



SECTION D-D
Post No. 3 through No. 8

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

METAL BEAM RAILING TERMINAL SYSTEM (TYPE SKT)

NO SCALE

A77L2

NOTES:

1. For additional details of Terminal System (Type ET), refer to the manufacturer's installation instructions.
2. Terminal System (Type ET) must be constructed so that the full length of the terminal system guard railing is in straight alignment. The Guard Rail Extruder head of the terminal system shall not encroach upon the adjacent paved shoulder or lane. A traffic approach flare of 50:1 or 25:1 for the full length of Terminal System (Type ET) installation may be used where the Guard Rail Extruder head would encroach upon the adjacent paved shoulder or lane.
3. Slide Guard Rail Extruder over the end of the rail element and attach to Post No.1 with lag screws. Do not bolt rail element to post. Guard Rail Extruder attachment brackets have 3 holes in each bracket to provide tolerance adjustment. Use the holes in the bracket closest to center of Post No.1. Drill ¼" pilot holes to accommodate lag screws.
4. Attach strut to Post Nos. 1 and 2 foundation tubes with hex head bolts, washers and hex nuts. Bolts extend through the strut, steel foundation tube, and wood posts. Channel side of strut to face downward.
5. For length and type of metal beam guard railing or metal barrier railing the terminal system is attached to, see Project Plans. For typical use of this terminal system, see the A77E, A77F and A77G Series of the Standard Plans.
6. Attach rail element to this post and block. Payment for this post, block and hardware included in payment for the type of railing or barrier the terminal system is attached to, not part of the payment for Terminal System (Type ET).
7. Yellow retroreflective sheeting, as provided by Terminal System (Type ET) manufacturer, shall be adhered to the face of extruder head. The sheeting shall be consistent with the design pattern and colors of a Type P object marker panel.
8. Attach rail to Post No.2 (no wood block) in same manner shown in section A-A. Do not bolt rail to Post No.1, See Note 3.
9. Terminal System (Type ET) not to be used where extrusion of the rail on the back side of the installation would be in the path of pedestrian or vehicular traffic.
10. A continuous rail element section between Post Nos.1 and 5 (no intermediate rail splices) may continue to be used in existing installations. New installations shall be constructed as shown with two rail element sections between Post Nos.1 and 5.
11. A 6'-0" length steel foundation tube, TS 8 x 6 x 3/16", without soil plate, may be used in place of the 4'-6" length steel foundation tube and soil plate shown. Minimum embedment of the 6'-0" length tube shall be 5'-9". A ⅝" ø hex head bolt and nuts shall be installed in the hole in the 6'-0" length tube to keep the wood post from dropping into the tube.

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

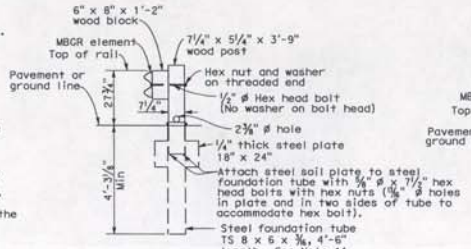
Randell D. Hiatt
REGISTERED CIVIL ENGINEER

May 1, 2006
PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.

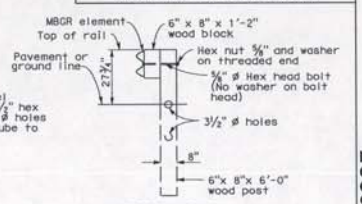
Randell D. Hiatt, C50200, Exp. 6-30-07, CIVIL, STATE OF CALIFORNIA

To get to the Caltrans web site, go to: http://www.dot.ca.gov



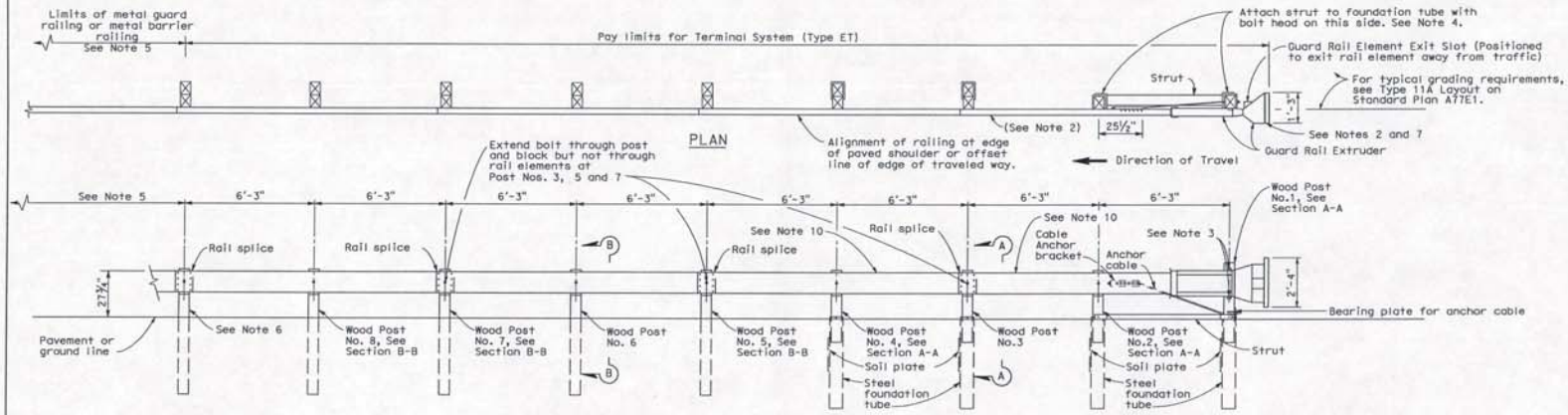
SECTION A-A

Soil plate and wood post attachment to steel foundation tube similar for Post Nos. 1, 2 and 4. Wood blocks not used with Post Nos.1 and 2. See Note 8.



SECTION B-B

Post Nos. 5, 7 and 8 similar except rail elements are not attached to Post Nos. 5 and 7



ELEVATION

TERMINAL SYSTEM (TYPE ET)

(Type ET PLUS shown)
See Notes 9 and 10

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

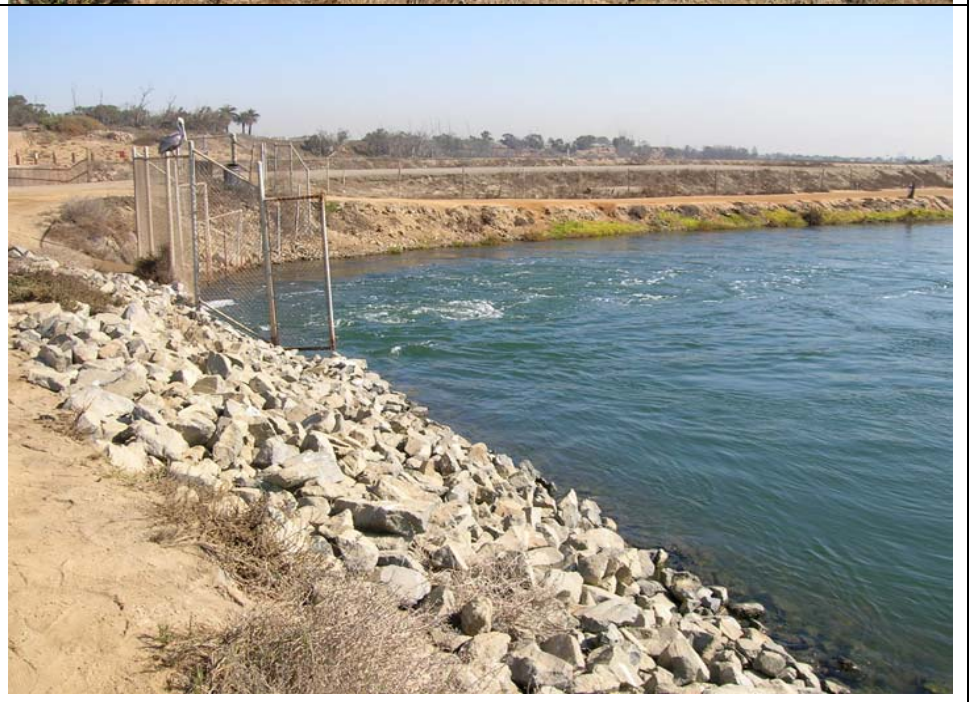
METAL BEAM RAILING TERMINAL SYSTEM (TYPE ET)

NO SCALE

A77L3

Appendix B

Photos of Project Location



Appendix C

Photos of High vs. Low Tide

High Tide 09:53AM 6.0 Ft Low Tide 03:53PM -0.25Ft

High Tide 09:53AM 6.0 Ft Low Tide 03:53PM -0.25Ft